

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Upon discussion of possible claim amendments to the set of claims filed on Oct. 2, 2009, Authorization for this examiner's amendment was given in a telephone interview with Applicant's representative, Mr. Eric Sutton, on Oct. 21, 2009.

Claim has been further amended as follows:

Cancel claims 37 and 47.

23. A machine-implemented method comprising the steps of:
- dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques by performing the steps of:
    - generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated I/O cost of using the available occurrence counting technique,
    - wherein generating cost estimates comprises performing ~~for each of the plurality of available occurrence counting techniques based on an estimated I/O cost~~ comprises, for a prefix tree technique:

determining a size of a candidate prefix tree;  
determining an amount of memory that can be used for the  
candidate prefix tree;  
comparing the size of the candidate prefix tree to the amount of  
memory that can be used to store the candidate prefix tree;  
and  
generating an I/O cost estimate for the a prefix tree technique  
based, at least in part, on the size of the candidate prefix  
tree and the amount of memory that can be used to store the  
candidate prefix tree;  
selecting the occurrence counting technique that has the lowest cost  
estimate; and  
during a frequent itemset operation, using said selected occurrence counting  
technique to count occurrences of at least one combination to determine  
whether said at least one combination satisfies frequency criteria  
associated with said frequent itemset operation;  
wherein the step of dynamically selecting and using said selected occurrence  
counting technique are performed by one or more computing devices.

38. A machine-implemented method comprising the steps of:  
dynamically selecting which occurrence counting technique to use from a  
plurality of available occurrence counting techniques based on conditions

existing before a frequent itemset operation is performed in a computing environment in which the frequent itemset operation is to be performed, wherein the conditions include how busy a computer system in which the frequent itemset operation is to be performed currently is; and during said frequent itemset operation, using said selected occurrence counting technique to count occurrences of at least one combination to determine whether said at least one combination satisfies frequency criteria associated with said frequent itemset operation; wherein the step of dynamically selecting and using said selected occurrence counting technique are performed by one or more computing devices; wherein:

the frequent itemset operation is performed in a plurality of phases, wherein each phase is associated with combinations that have a particular number of items; the step of dynamically selecting includes dynamically selecting which occurrence counting technique to use for at least one phase of said plurality of phases; and the step of using includes using said selected occurrence counting technique to determine whether candidate combinations for said at least one phase satisfy said frequency criteria; said at least one phase is a phase during which combinations having N items are processed;

a first occurrence counting technique is selected for said phase of said frequent itemset operation;  
dynamically selecting a second occurrence counting technique in the phase of a subsequent frequent itemset operation during which combinations having N items are processed; and  
wherein the first occurrence counting technique is different from said second occurrence counting technique.

39. The machine-implemented method of Claim ~~[[37]]~~38, further comprising:  
determining that a particular occurrence counting technique will not be considered during any phase of the frequent itemset operation; and  
performing the frequent itemset operation without performing startup operations for said particular occurrence counting technique.
40. The machine-implemented method of Claim ~~[[37]]~~38, wherein:  
~~the frequent itemset operation is performed in~~ plurality of phases comprises at  
least a first phase and a second phase;  
the first phase is associated with combinations that have a first number of items;  
the second phase is associated with combinations that have a second number of items; and

the occurrence counting technique selected for the first phase and the occurrence counting technique selected for the second phase are different.

41. A volatile or non-volatile computer-readable storage medium storing one or more sequences of instruction, wherein execution of the one or more sequences of instruction by one or more processors causes the one or more processors to perform:

dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques by performing the steps of:

generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated I/O cost of using the available occurrence counting technique,

wherein generating cost estimates comprises performing for each of the plurality of available occurrence counting techniques based on an estimated I/O cost ~~comprises, for a prefix tree technique:~~

determining a size of a candidate prefix tree;

determining an amount of memory that can be used for the candidate prefix tree;

comparing the size of the candidate prefix tree to the amount of  
memory that can be used to store the candidate prefix tree;  
and  
generating an I/O cost estimate for the a prefix tree technique  
based, at least in part, on the size of the candidate prefix  
tree and the amount of memory that can be used to store the  
candidate prefix tree;  
selecting the occurrence counting technique that has the lowest cost  
estimate; and  
during a frequent itemset operation, using said selected occurrence counting  
technique to count occurrences of at least one combination to determine  
whether said at least one combination satisfies frequency criteria  
associated with said frequent itemset operation.

48. A volatile or non-volatile computer-readable storage medium storing one or more sequences of instruction, wherein execution of the one or more sequences of instruction by one or more processors causes the one or more processors to perform:

dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques based on conditions existing before a frequent itemset operation is performed in a computing environment in which the frequent itemset operation is to be performed,

wherein the conditions include how busy a computer system in which the frequent itemset operation is to be performed currently is, and an amount of volatile memory available to store a candidate prefix tree; and

during said frequent itemset operation, using said selected occurrence counting technique to count occurrences of at least one combination to determine whether said at least one combination satisfies frequency criteria associated with said frequent itemset operation;

wherein:

the frequent itemset operation is performed in a plurality of phases, wherein each phase is associated with combinations that have a particular number of items;

the dynamically selecting includes dynamically selecting which occurrence counting technique to use for at least one phase of said plurality of phases; and

the using includes using said selected occurrence counting technique to determine whether candidate combinations for said at least one phase satisfy said frequency criteria;

said at least one phase is a phase during which combinations having N items are processed;

a first occurrence counting technique is selected for said phase of said frequent itemset operation;

dynamically selecting a second occurrence counting technique in the phase of a subsequent frequent itemset operation during which combinations having N items are processed; and

wherein the first occurrence counting technique is different from said second occurrence counting technique.

49. A volatile or non-volatile computer-readable storage medium as recited in Claim [[47]]48, wherein execution of the one or more sequences of instruction further causes the one or more processors to perform:
- determining that a particular occurrence counting technique will not be considered during any phase of the frequent itemset operation; and performing the frequent itemset operation without performing startup operations for said particular occurrence counting technique.
50. A volatile or non-volatile computer-readable storage medium as recited in Claim [[47]]48, wherein:
- ~~the frequent itemset operation is performed in~~ plurality of phases comprises at least a first phase and a second phase;



the first phase is associated with combinations that have a first number of items;  
the second phase is associated with combinations that have a second number of  
items; and  
the occurrence counting technique selected for the first phase and the  
occurrence counting technique selected for the second phase are  
different.

***Reason for allowance***

Reason for allowance of the pending claims has been already indicated in the  
previous Office Actions mailed on 5/28/2008 (page 5 – 6), 11/26/2008 (pages 5 – 6) and  
2/2/2009 (pages 13 – 14).

Any comments considered necessary by applicant must be submitted no later  
than the payment of the issue fee and, to avoid processing delays, should preferably  
accompany the issue fee. Such submissions should be clearly labeled "Comments on  
Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the  
examiner should be directed to SANGWOO AHN whose telephone number is (571)272-  
5626. The examiner can normally be reached on M-F 10-6.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Tim T. Vo/  
Supervisory Patent Examiner, Art Unit 2168

10/21/2009  
/S. A./  
Examiner, Art Unit 2168